BUREAU OF ENVIRONMENTAL REMEDIATION/REMEDIAL SECTION GUIDANCE

SCOPE OF WORK (SOW) FOR A COMPREHENSIVE INVESTIGATION (CI)/CORRECTIVE ACTION STUDY (CAS)

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The Comprehensive Investigation and Corrective Action Study (CI/CAS) process outlined in the Scope of Work (SOW) provides an outline that should be followed for characterizing the nature and extent of risks posed by contaminated sites and for evaluating potential remedial options. This SOW is a flexible process that can be tailored to specific characteristics and needs at individual sites. The CI/CAS SOW provides a continuous process to investigate and remediate contaminated sites in a time efficient and cost effective manner.

The primary objectives of the **Comprehensive Investigation (CI)** are described as follows:

1) All source areas must be adequately characterized (i.e. type and nature of source(s) of contaminants, cause of release, estimated quantity of release(s), and if the release(s) is/are active or inactive).
2) The extent (vertical and horizontal) of contamination from the site must be characterized (including the migration mechanisms).
3) To adequately characterize the chemical and physical properties of the contaminants, their mobility and persistence in the environment and their important fate and transport mechanisms.
4) The identification of any human and environmental targets that may be affected by contamination.
5) *A risk assessment of contaminants effect on identified target areas.
6) To gather a sufficient amount of data to develop an initial list of corrective action alternatives (short term and long term) to be further evaluated during the CAS.

The primary objectives of the **Corrective Action Study (CAS)** are described as follows:

1) to evaluate the feasibility, effectiveness, and cost of at least two (2) plausible remedial actions based upon the findings of the CI and to evaluate the "no action"

alternative.

2) to recommend and justify a specific corrective action for the site.
3) to determine the health and environmental effects of the remedial action.

This Scope of Work outlines the activities to be completed as part of the CI/CAS. A work plan that describes in detail the CI/CAS activities shall be developed and submitted to KDHE for review and approval. In addition, the work plan must include the following appendices: 1) quality assurance project plan; 2) sampling and analysis plan; 3) field sampling plan; and 4) health and safety plan.

The Scope of Work shall at a minimum include the following components:

1.0 HISTORICAL EVALUATION AND SITE DESCRIPTION

A description of the site location should be provided, including legal description, facility address, property owned, and facility layout, as appropriate. A description of all past and present activities or operations conducted at the site must be included in the CI Report including: nature of business conducted at the site; chemicals used; wastes generated; chemical and waste disposal methods; spills; leaks; etc. Description and summary of significant findings of previous environmental investigations conducted at the site. A listing of environmental permits issued relative to past or present business operations. Past and present landowners or facility owners should be identified. Documentation must be included in the CI Report to support the findings. This component of the Comprehensive Investigation may be excluded if a KDHE-approved Preliminary Investigation (PI) was conducted at the site or if sufficient background information about the site has been previously documented and submitted to KDHE.

2.0 STUDY AREA INVESTIGATION

A description of the physical characteristics of the study area must be provided including, but not limited to: geology, soils, hydrogeology, surface water hydrology, and meteorology. Past and present land use in and adjacent to the site must be described. Current city and/or county land use zoning classification must be documented. Characterization of the physical characteristics of the study area should be of sufficient quality to facilitate the evaluation of appropriate remedial responses, if determined necessary. References must be documented and included in the report, as defined in 7.0.

3.0 SOURCE CHARACTERIZATION

A detailed description of all field activities employed and the findings thereof to identify

the source(s) of environmental contamination and their associated release mechanisms. This may include several components: review of facility records; personnel interviews; waste and/or soil sampling; equipment testing (tank, pipeline, or sewer line testing, etc.); geophysical surveys; aerial photograph review; and land elevation surveys, among others.

4.0 NATURE AND EXTENT CHARACTERIZATION

A study to determine the full horizontal and vertical extent of environmental contamination must be performed. Potential media to be investigated include: surficial and subsurface soils; ground water; surface water; sediment; air; and biota. An evaluation of the significant contaminant fate and transport mechanisms should be performed. This component of the CI may include: monitoring well or piezometer installation; soil borings; soil or ground water probing; multi-media sampling; field and laboratory analyses; geophysical analyses; hydrogeological analyses; surveying; modeling; and biota studies. Analytical data should be collected of appropriate data quality and quantity to support the Risk Assessment, if performed, and to support the evaluation of potential remedial alternatives. All data should be validated at the appropriate field or laboratory quality control level to determine whether it is appropriate for its intended use.

5.0 RISK ASSESSMENT (Optional)

Information and environmental data collected and validated as representative of site conditions, may be used to qualitatively or quantitatively describe the potential excess human health risk and/or ecological risk posed by the site in the absence of remediation. The Risk Assessment should include: a site-specific conceptual model; a listing of all direct and indirect exposure pathways; a complete listing of all chemicals of concern; an exposure assessment; a toxicity assessment; a description of the current and future land use; risk characterization; and an uncertainty analysis.

6.0 IDENTIFICATION OF CORRECTIVE ACTION ALTERNATIVES

Information and data generated during the Comprehensive Investigation, including the Risk Assessment, if performed, should be evaluated to develop a preliminary list of remedial action objectives and to identify federal, state, and local laws, standards, guidelines, etc. In addition, an initial list of general response actions or potential corrective action alternatives should be developed which will be evaluated in detail during the Corrective Action Study (CAS).

7.0 CI REPORT

Upon completion of all Comprehensive Investigation activities necessary to achieve the objectives of the CI Scope of Work, a Comprehensive Investigation Report must be submitted to KDHE for review and approval. The CI Report should include all

information and data collected from during the investigation and describe in detail the work performed to accomplish the objectives as set forth within this SOW. The CI Report format shall be consistent with this Scope of Work and include appropriate tables, figures, well logs, laboratory analytical data, references, appendices, etc.

8.0 EVALUATION OF CORRECTIVE ACTIONS

The Corrective Action Study is the process where a detailed assessment of at least two plausible corrective action alternatives and a "no action" alternative is performed. The evaluation must include: 1) a description of the contaminants of concern within each environmental media; 2) an identification of all real and potential human and environmental targets and an evaluation of all direct and indirect exposure pathways; 3) a description of the site-specific corrective action goals; 4) treatability studies for corrective actions considered innovative or unproven; and 5) a detailed individual and comparative analysis of each of the proposed corrective actions, and the "no action" alternative, to evaluate their ability to satisfy the following criteria:

a) over-all protection of human health and environment;

b) compliance with Federal and State ARARs (applicable, or relevant and appropriate requirements);

c) long-term effectiveness and permanence;

d) reduction of toxicity, mobility and volume through treatment;

e) short-term effectiveness;

f) implementability;

g) cost; and

h) community acceptance.

9.0 RECOMMEND A CORRECTIVE ACTION

The detailed evaluation of potential corrective action alternatives shall provide the basis for recommending and supporting a specific corrective action or group of corrective actions for the site, which satisfies the requirements as defined in Section 8.0.

10.0 CORRECTIVE ACTION STUDY REPORT

The Corrective Action Study Report shall include: 1) a brief summary of the findings of

the Comprehensive Investigation, including risk assessment if performed; 2) a description of the site-specific corrective action goals; 3) a detailed description of each corrective action alternative evaluated, including the "no action" alternative; 4) a detailed discussion of each corrective action alternative evaluated in the context of satisfying the criteria defined in Section 8.0; 5) a recommendation for corrective action at the site; and 6) an Appendix containing any background information or literature which was used to evaluate each corrective action alternative.

11.0 SCHEDULE

The CI/CAS Work Plan must include an implementation schedule defining the dates for initiating and completing all activities and for submitting work plans and reports defined as deliverable documents within the Consent Order.